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DETAILED DESCRIPTION

[Detailed Description of the Invention]**[0001]**

[Field of the Invention] This invention relates to the structure of the joint member of the power transmission device for vehicles, and the joint member of a division propeller shaft, for example.

[0002]

[Description of the Prior Art] What is indicated as a joint member of the conventional power transmission device to JP,2002-65538,A applied, for example to the propeller shaft of vehicles is known.

[0003] Namely, the cylindrical shaft object in which a power transmission device consists of fiber reinforced resin (FRP), It comprises an adjustable joint connected with the both ends of this cylindrical shaft object, the power outputted via the gearbox from the engine is inputted into a cylindrical shaft object from one adjustable joint, and it is further transmitted to a rear wheel via a differential gear etc. from the adjustable joint of another side.

[0004] Said cylindrical shaft object is formed in long picture prescribed length, and the cylindrical inner layer is formed in the inner circumference of the both ends. On the other hand, the adjustable joint comprises an input-shaft yoke and this output-shaft yoke by which input-shaft yoke connection was carried out.

[0005] Said output-shaft yoke comprises a yoke part by the side of the tip connected with an input-shaft yoke via a spider, and a cylindrical fitting part which it is formed in this yoke part at one, and carries out press fitting to the end of said cylindrical shaft object.

[0006] The flange in which this fitting part makes this inner layer for the peripheral face to be mostly formed in the diameter of uniform, and exfoliate from the outer layer of a cylindrical shaft object in contact with said inner layer when the excessive axial load to direction opposing is mutually inputted into a cylindrical shaft object and an output-shaft yoke at the periphery by

the side of a yoke part is formed in one.

[0007]The serration part which carries out serration fitting is formed in the point peripheral face of said flange and an opposite hand along shaft orientations in the end inner skin of said cylindrical shaft object, and a fitting part. When pressing fit in the end rim periphery of said point into the one end part of said cylindrical shaft object, the guide surface to which it shows said point inside is formed.

[0008]This guide surface is mostly formed in cone tapered shape, and the inside diameter by the side of a tip edge is formed in the byway rather than the end inside diameter of the cylindrical shaft object, and the periphery veranda is formed to said serration part.

[0009]And in order to combine a fitting part with the end of a cylindrical shaft object, The crevice end of the serration part of a fitting part is first plastered with liquid packing in a circle, Then, the guide surface of a point is made for a fitting part to contact the end internal circumference edge of a cylindrical shaft object, doubling the axis of a cylindrical shaft object, and the axis of a fitting part on the same axle with predetermined equipment, and said point is pushed in in the end of a cylindrical shaft object in this state. By this, insert a fitting part, showing around in a guide surface, and. It moves forward to shaft orientations, making the heights of a serration part eat into the inner skin of the inner layer of a cylindrical shaft object, the pushing position is regulated in a position just before the apical surface of an inner layer runs against a flange, and serration bonding is performed by this.

[0010]

[Problem to be solved by the invention]By the way, in order to face pressing a fitting part fit to a cylindrical shaft object and to set up both axis on the same axle as mentioned above, from high-precision equipment and fixture being required generally, A tapered shape guide surface is formed in the point of a fitting part as mentioned above, and the same axle nature of the guidance at the time of insertion and both is secured.

[0011]However, since the inside diameter by the side of a tip edge is only formed in the simple tapered shape formed in the byway rather than the end inside diameter of the cylindrical shaft object, said conventional guide surface, For example, when the cone angle of this guide surface, i.e., the rise angle to the periphery edge from a tip edge, is comparatively large, Since the rise angle of a guide surface is large when the fitting part was stuffed into the cylindrical shaft inside of the body using the guide surface and it eats into the inner skin of the inner circumference layer of a cylindrical shaft object by the serration heights of the periphery edge of a guide surface, the frictional resistance at the time of intrusion by serration heights becomes large. For this reason, there is what is called a possibility that will be in the state of stripping off without the crowning of serration heights eating into the inner skin of said inner circumference layer finely that it can pluck and a phenomenon may occur.

[0012]As a result, the press fit cost of the serration uneven part of a fitting part and the inner

circumference layer of a cylindrical shaft object decreases, the friction fastening force between both declines, and there is a possibility that the transmitting torque from a cylindrical shaft object to an output side yoke may become small.

[0013]On the other hand, since the effective length of a serration part becomes short and the fitting surface product of this serration part and the inner skin of said inner circumference layer becomes small shortly when the cone angle of said guide surface is set up small, the friction fastening force between both also declines and the transmitting torque from a cylindrical shaft object to an output side yoke becomes small. And since the point of a guide surface is formed smaller than the inside diameter of the inner circumference layer of a cylindrical shaft object, the point of a fitting part must be lengthened more than needed, and there is a possibility of inviting a jump and weight increase of cost.

[0014]

[Means for solving problem]This invention was thought out in view of technical problem of said conventional joint member, and the invention according to claim 1, Especially follow said serration, and form an inclined form guide surface in the point end rim of the fitting part of a yoke along the shaft orientations to which it shows the point of said fitting part at the time of the press fit to the one end part of said cylindrical shaft object, and. This guide surface is characterized by having been formed as a notching part by which the tip side is formed as a guide part of an outer diameter [byway / inside diameter / of said cylindrical shaft object / one end part], and between this guide part and fitting part peripheral faces follows said serration part, and forming said guide part in the direction of a tip in the shape of diameter reduction gradually.

[0015]Therefore, according to this invention, since a guide part by the side of a tip of a guide surface is set as a byway rather than an inside diameter of a cylindrical shaft object when pressing a fitting part fit in an inside of a cylindrical shaft object at the time of attachment of each component parts, the same axle nature of both axis is securable.

[0016]And as mentioned above, since a guide part and a notching part were divided for a guide surface, each cone angle can be set up arbitrarily and a cone angle of said notching part can be made small. By this, generating of frictional resistance of serration heights at the time of press fit and an inner circumference layer can be controlled, it can pluck, and generating of a phenomenon can be prevented.

[0017]By having set up an angle of gradient of said notching part smaller than an angle of gradient of said guide part, Since it can pluck as mentioned above, and an angle of gradient of the whole guide surface is not made small not only like the ability of generating of a phenomenon to be prevented certainly but like said conventional technology but an angle of gradient of only a notching part can be made small, it is not necessary to extend the length of shaft orientations of a fitting part. Therefore, a jump of weight increase or material cost can be

prevented.

[0018] Since said serration part was uniformly formed in a circumferential direction of a peripheral face of a fitting part, frictional resistance of a fitting part to inner skin of a cylindrical shaft object becomes uniform by a circumferential direction, and big frictional resistance can be secured. Therefore, transmitting torque performance between a cylindrical shaft object and a yoke improves.

[0019]

[Mode for carrying out the invention] The embodiment which applied the joint member concerning this invention to the propeller shaft for vehicles which is a power transmission device as usual hereafter is explained in full detail based on Drawings.

[0020] Drawing 4 shows the propeller shaft for vehicles to which the joint member of this invention is applied. The cylindrical shaft object in which ten in a figure consists of carbon-fiber-reinforced-resin material (CFRP), and 11 are output side yokes which are the adjustable joint components of the one side connected with the both ends 10a and 10b of this cylindrical shaft object 10, and these output side yokes 11 and 11 are provided with the following.

The joint parts 14 and 14 coordinated with the input-side yokes 12 and 12 via the spiders 13 and 13, respectively.

The almost cylindrical fitting parts 15 and 15 to which it is joined to the end of these joint parts 14 and 14 in one, and press fitting of the both ends 10a and 10b of said cylindrical shaft object 10 is carried out.

[0021] The inside diameter of the both ends 10a and 10b of a main part in which said cylindrical shaft objects 10 are outer layers is formed in the diameter of uniform, and the inner layers 16 and 16 are formed in the inner circumference of the both ends 10a and 10b, respectively.

[0022] As shown in drawing 1 and drawing 3, said joint part 14 and the fitting part 15 are joined to shaft orientations by forging in one, and, as for said output-shaft yoke 11, each is constituted.

[0023] If it explains concretely, as shown in drawing 1, it has said joint part 14 at one in the base 14a of roofed cylindrical shape, and the point of this base 14a, and it is formed from the about U character-shaped yoke parts 14b and 14b which have the holding holes 14c and 14c where said spider 13 is engaged, respectively. On the other hand, said fitting part 15 is formed almost cylindrical, and the serration part 17 which carries out serration bonding to said inner layer 16 of a peripheral face is formed, and the flange 18 is formed in the part which does not have the serration part 17 by the side of said joint part 14 of a peripheral face at one.

[0024] As shown in drawing 1, it is formed in the shape of [general] a cross section uneven waveform, and arrangement formation of the V type-like crevice 17a and the reverse V type-like heights 17b is carried out by turns, and said serration part 17. It is formed in prescribed

length along shaft orientations of the fitting part 15, and is uniformly formed in the whole circumferential direction of the fitting part 15.

[0025]As said flange 18 is shown in drawing 3, when a peripheral face of the fitting part 15 carries out press fitting to the end 10a of said cylindrical shaft object 10, serration bonding is carried out to it from shaft orientations and it is functioning as a power transmission device, The inner layer 16 making this inner layer 16 each output-shaft yoke 11 and the cylindrical shaft object 10 exfoliate from an outer layer (main part) in contact with the time of load of shaft orientations more than predetermined inputting from a direction compared mutually from the apical surface 16a, an outer layer is destroyed and a shock is made to absorb.

[0026]As shown in drawing 1 and drawing 2, when pressing this fitting part 15 fit in the inside of the inner circumference layer 16 from the both ends 10a and 10b of said cylindrical shaft object 10, the tapered shape guide surface 19 to which it shows this press fit is formed in the periphery edge of the point 15a of said fitting part 15.

[0027]This guide surface 19 comprises the notching part 21 by the side of a periphery from the guide part 20 and this guide part 20 by the side of a tip, as shown in drawing 2, and as for both 20 and 21, that boundary part is mostly formed in the shape of [*****-like] two step.

[0028]If it explains concretely, said guide part 20 is formed in cone tapered shape, that cone angle theta 1 is set as about 30 degrees by this embodiment, and the outer diameter d1 of the tip edge 20a is set up smaller than the inside diameter of the inner circumference layer 16 of said cylindrical shaft object 10. the inclined plane of the guide part 20 -- it is set up so that the crevice 17a bottom of said serration part 17 may be mostly located in the middle position.

[0029]On the other hand, similarly it is formed in cone tapered shape, that cone angle theta 2 is set as about 10 degrees by this embodiment, and said notching part 21 is set up smaller enough than the cone angle theta 1 of the guide part 20, as shown in drawing 2.

[0030]Therefore, in [according to this embodiment] the time of the assembly of each component parts, When carrying out press fit immobilization of the fitting parts 15 and 15 of each output side yoke 11 using predetermined equipment to the both ends 10a and 10b of the cylindrical shaft object 10, If the guide surface 19 of each of this fitting part 15 is pressed against the outer edge internal circumference edge of the inner circumference layer 16 of each ends 10a and 10b of the cylindrical shaft object 10, First, the guide part 20 of the guide surface 19 contacts the apical surface 16a toe edge of the inner circumference layer 16, and the inside of the cylindrical shaft object 10 is guided, positioning the axis of the cylindrical shaft object 10, and the axis of the fitting part 15 so that it may become a same axle top. At this time, since the cone angle theta 1 of the guide part 20 is formed comparatively greatly, guidance to the method of the inside of the inner circumference layer 16 becomes easy.

[0031]Then, if said fitting part 15 is gradually pushed in by a predetermined pressure, the notching part 21 whose cone angle is [/ after the guide part 20 showed around] small will

move forward, while the serration heights 17b eat into the inner skin of the inner circumference layer 16 in contact with the internal circumference edge of the inner circumference layer 16 of the cylindrical shaft part 10. At this time, since the cone angle theta 2 of the notching part 21 is smaller enough than the guide part 20, the frictional resistance to the inner skin of the inner circumference layer 16 becomes small. Therefore, it becomes easy, slitting by the serration heights 17b can be plucked, and generating of a phenomenon can be prevented.

[0032]Then, as shown in drawing 3, pushing movement beyond it is prevented in the stage which pushed in the fitting part 15 as it was and to which the one side face of the flange 18 ran against the apical surface 16a of the inner circumference layer 16.

[0033]Thus, according to this embodiment, in early stages of press fit of the fitting part 15 into the cylindrical shaft object 10, both 10 and 15 axis can be made to agree, and same axle nature can be easily obtained by the guide part 20 of the guide surface 19, and an effective guidance function is exhibited. Therefore, the equipment for securing same axle nature, etc. become unnecessary, and smooth insertion work can be done with a guidance function not to mention the ability to attain cheap-ization of cost.

[0034]And from being able to pluck by having formed the small notching part 21 of the cone angle theta 2, and generating of a phenomenon being prevented. When the intrusion nature of the serration part 17 to the inner skin of the inner circumference layer 16 becomes good and presses the fitting part 15 fit in the inner circumference layer 16 thoroughly, the fall of the friction fastening force of the fitting part 15 and 16 of the inner circumference layer 16 is prevented. As a result, the torque convectivity between the cylindrical axis 10 and each output side yoke 11 becomes good.

[0035]Since the cone angle of the guide surface 19 whole is not made small but the cone angle theta 2 of only the notching part 21 is made small like said conventional technology, it is not necessary to extend the length of the shaft orientations of the fitting part 15. Therefore, the jump of weight increase or material cost can be prevented.

[0036]After fitting in thoroughly, the frictional resistance of the fitting part 15 to the inner skin of said inner circumference layer 16 becomes uniform by a circumferencial direction, and big frictional resistance can be secured from having formed said serration part 17 in the circumferencial direction of the peripheral face of the fitting part 15 uniformly. Therefore, the torque convective ability between the cylindrical shaft object 10 and the yoke 11 improves further.

[0037]Drawing 5 and drawing 6 show a 2nd embodiment of this invention, and form the guide surface 19 in flatness-like the circular tapered surface instead of a tapered surface. That is, the guide part 20 is formed in the circle tapered surface where that curvature is comparatively big, and that cone angle theta 3 is set as about 55 degrees by this embodiment. On the other hand, the notching part 21 is formed in the circle tapered surface where that curvature is smaller than

the guide part 20, and that cone angle theta 4 is set as about 30 degrees by this embodiment. It is formed so that the pars basilaris ossis occipitalis of said serration crevice 17a may be located near the center of the guide part 20.

[0038]Therefore, according to this embodiment, the same operation effect as a 1st embodiment is obtained, and the effective guide function by the guide part 20 is exhibited, and the same axle nature of the cylindrical shaft object 10 and the fitting part 15 is securable.

[0039]the inner circumference layer 16 by the serration heights 17b at the time of press fit is received by the small notching part 21 of the cone angle theta 4 -- it plucks, generating of a phenomenon is prevented, the fall of the friction fastening force of the fitting part 15 and the inner circumference layer 16 is prevented, and torque convectivity becomes good.

[0040]It is not limited to the composition of each of said embodiment, and this invention can also change arbitrarily the cone angle of each guide part 20 of the guide surface 19, or the notching part 21 according to conditions, such as specification of a joint member, and a size, for example.

[Translation done.]